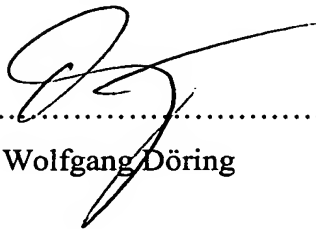


DECLARATION

I, Dr. Wolfgang Döring, Patent Attorney, of Mörikestr. 18, 40474 Düsseldorf, Federal Republic of Germany, do hereby declare that I am conversant with the German and English languages and I certify that the following translation is to the best of my knowledge and belief a true and correct translation of the authentic text of the PCT application PCT/DE 2002/003776.



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Dr. Wolfgang Döring

Düsseldorf, April 20, 2005

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10 **Flue Gas Washer with a Supporting Construction for Spray
 Pipes**

The present invention is directed to a flue gas washer with
a supporting construction for spray pipes for cleaning at
15 least one horizontally disposed droplet separator system
which is formed by droplet separator packets which are
supported on carriers.

Normally, flue gas washers have at least one coarse
20 separator stage and one fine separator stage which are
disposed one above the other on a respective carrier system
with a height distance which allows a manual inspection
between the two separator stages. Each separator stage
consists of a plurality of identical separator members
25 which are droplet separator packets put together by
individual droplet separator lamellae respectively.

Such droplet separator systems have to be periodically
cleaned since they contaminate with continuous use. For
30 this, one has incorporated spray pipes into the flue gas
washers normally above, below and between the individual

droplet separator systems so that the same can be sprayed with an appropriate cleaning medium (water) on both sides for cleaning purposes. The spray pipes are carried by supporting constructions which assure a uniform
5 distribution of the spray pipes over the cross-section of the flue gas washer.

It is known to dispose the supporting constructions for the spray pipes at the carriers on which the droplet separator
10 packets are supported. For instance, these supporting constructions are defined by supporting members extending upwardly and downwardly from the carriers and supporting corresponding supporting frames on which the spray pipes are disposed.

15 Such systems have to be inspected and cleaned periodically in order to maintain the operability of the spray pipes. However, inspections can be carried out only in a difficult manner with such systems since the supporting construction
20 for the spray pipes consisting of the supporting members arranged at the carriers and the supporting frame for the spray pipes hinders a traversing which has to be carried out in the range of the carriers. Accordingly, inspections, especially cleaning processes, which have to be carried out
25 at a point of time necessarily can be carried out only with more difficult circumstances with such systems.

The above-cited difficulties exist always if the supporting construction for the spray pipes is disposed at the
30 carriers for the droplet separator systems since in this manner the space above and below the carriers is occupied

by the supporting members and the supporting frames crossing the carriers. In many cases these supporting frames are also connected to the washer wall itself so that in this range a traversing is made more difficult either.

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Accordingly, in order to arrange the spray pipes in flue gas washers their supporting constructions have to be mounted at the carriers for the droplet separator systems and thus at the washer itself. This means an additional effort for the manufacturer of the washer since the same has to supply a thoroughly adjusted embodiment with an exact size which has to be considered critically, especially if the carrier systems obtain an anti-corrosion coating, for instance a rubber coating.

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It is the object of the present invention to provide a flue gas washer of the cited kind which can be inspected in an especially simple manner.

20 According to the invention this object is achieved with a flue gas washer of the cited kind by the feature that the supporting construction for the spray pipes is disposed at or between the droplet separator packets.

25 The decisive difference of the inventive solution with respect to the above-cited prior art consists in the feature that the supporting construction for the spray pipes is not directly connected to the construction of the flue gas washer, for instance the carriers thereof, but is rather disposed at or between the droplet separator packets and is also installed together with the same. This has the

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advantage that the manufacturer of the flue gas washer has not to take into consideration the mounting of the supporting construction for the spray pipes or has to already provide his system with such a supporting
5 construction but that the supporting construction can be provided with the spray pipes when the droplet separator system or droplet separator systems are installed. Accordingly, the supporting construction forms a component of the separator system.

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The space above and below the carriers for the supporting of the droplet separator packets is kept free by the inventive shifting of the supporting construction to the separator system and the mounting of the same at or between
15 the individual droplet separator members or droplet separator packets. Accordingly, the supporting construction is shifted to the range between the carriers whereby traversing paths for inspection purposes are provided above and below the carriers which are not interrupted by
20 supporting members or carrier elements running in transverse direction. The height of these traversing paths is determined by the distance between the supporting systems for the droplet separator systems.

25 The carriers, which are supported on the individual separator packets which form the separator systems, are normally double-T-beams (H-beams) or hollow profiles on the upper flanges of which the individual separator packets are located. According to the prior art the space between
30 adjacent separator packets was used for the mounting of the vertical supporting members so that the space above the

carriers could no more be traversed. According to the invention now the supporting construction is shifted away from the carrier to the left and to the right so far that a sufficiently large free space results in the range above
5 and below the carrier which enables a traversing of the system for inspection purposes. The supporting construction is carried by the separator packets themselves or is disposed between the same (if a plurality of separator packets are arranged between adjacent carriers) wherein, in
10 the last cited case, they are carried by the separator system consisting of the plurality of separator packets. Of course, the separator packets are formed or connected to one another in such a manner that they can carry the supporting construction.

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With such embodiments according to which the supporting construction for the spray pipes is disposed at the droplet separator packets preferably the droplet separator packets have reinforced end portions for the arrangement of the
20 supporting construction. These reinforced end portions have not to extend over the whole width of the droplet separator packets but can form only a part herefrom. Preferably, the reinforced end portions are formed in a box-like manner.

25 According to this embodiment the reinforced end portions are appropriately penetrated by at least one rod-like supporting member wherein the supporting member, which is provided for the supporting construction of the spray pipes, can extend on one side or on both sides upwardly
30 and/or downwardly out of the reinforced end portions (box-like portions) of the droplet separator packets.

Preferably, the supporting construction for the spray pipes is formed by a spray pipe carrying member by means of which a plurality of supporting members, especially two, are connected to one another. So, for instance, a droplet
5 separator packet with reinforced end portions can be provided between two adjacent carriers wherein both reinforced end portions are penetrated by a respective supporting member which extends upwardly and downwardly and wherein the two supporting members are connected by a
10 carrying member above and below on which, for instance, two spray pipes are disposed which extend parallel with respect to the carriers. Of course, the supporting members are fixed at the reinforced end portions of the droplet separator packets so that, on the whole, a stable good
15 bearing formation is generated.

According to another embodiment the rod-like supporting members consist of several parts and have a connecting point outside of the reinforced end portion. Here, for
20 instance, a supporting member extends through the reinforced (box-like) end portion and serves as holding device for further supporting members extending downwardly and/or upwardly and holding the carrying members for the spray pipes. For instance, the supporting members can be
25 screwed with one another.

If possible, one can also desist from the supporting member penetrating the reinforced end portions so that the supporting members are fastened only at the outside of the
30 reinforced (box-like) end portions, for instance through flanges which are provided there.

According to still another embodiment the reinforced end portions are formed in such a manner that rod-like supporting members can be inserted into the same. Here the reinforced (box-like) end portion has a slot at the upper side, for example, through which the supporting member is inserted. In its interior the end portion has an appropriate reception device for the supporting member.

Preferably, the supporting members are formed in a rod-like manner, i.e. they have no great extension in the direction parallel with respect to the carriers. For this suitable flat profiles can be used. The small extension in the direction parallel with respect to the carriers has the advantage that an inspection of the separator packets is possible from the traversing paths above and below the carriers.

Preferably, the separator packets are provided with the reinforced end portions directly by the manufacturer so that a one-part formation results. However, it is not excluded that the reinforced end portions are mounted to the separator packets by means of removable or not-removable connections.

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Of course, not all the droplet separator packets have to be provided with reinforced end portions. If, for instance, three or more separator packets are disposed between adjacent carriers only the two packets adjacent to the carriers can be reinforced at their end portions adjacent to the carriers while the central packet is formed normally

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and the two central end portions of the two outer packets are not reinforced either. It is essential that only those separator packets carrying the supporting construction for the spray pipes have reinforced end portions or only one
5 reinforced end portion.

It was already mentioned that the reinforced end portions preferably extend only over a part of the width of the separator packets. So, the same are preferably centrally
10 disposed with respect to the width of the packets while normal lamellae of the separator packet are disposed on both sides of the reinforced (box-like) portion. Accordingly, the reinforced end portions form a reinforced or stiffened core suitable for carrying the supporting
15 construction.

According to another embodiment of the invention the supporting construction is formed by supporting members which are disposed between adjacent droplet separator
20 packets respectively. This embodiment is used if between two adjacent carriers two or more droplet separator packets are provided which are connected with one another by means of suitable connection means, for instance flange connections. According to the invention here the supporting
25 member is disposed at the connection point between two droplet separator packets and is connected to the adjacent packets so that the same commonly carry the supporting member. Of course, it is also possible according to the invention to provide two short droplet separator packets
30 instead of one long packet and to install a supporting member at the connection point between the same.

Preferably, the supporting members are connected to the separator packets by means of flange connections.

- 5 According to this embodiment the vertical supporting members carry the spray pipes preferably directly. However this does not exclude that also in this case carrying members on which the spray pipes are disposed can be provided between supporting members.

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- Also in this embodiment the supporting members are formed in a rod-like manner or have the shape of a slim plate. They can be adapted to the lamellar shape of the packets in the range between the adjacent separator packets, for
15 instance not formed rectilinearly in this range but adapted to the angular or curve-like course of the lamellae.

- According to the last cited embodiment normally a reinforcement of the end portions of the droplet separator
20 packets is not necessary. However, such a reinforcement at the end portions between which a supporting member is disposed is not excluded.

- Generally, stable and flexible materials, as for instance
25 special steel but also plastics, as glass-reinforced plastics, are used as materials for the supporting construction. Even the spray pipes can consist of glass-reinforced plastics. In this case one can work with especially large supporting distances which, for instance,
30 are three times larger than with polypropylene.

Furthermore, the invention is directed to a supporting construction for the use in a flue gas washer according to one of the patent claims 1-11.

5 In the following the invention is described by means of examples in connection with the drawing in detail. Of the drawing

10 Figure 1 shows a side view of a part of a flue gas washer;

Figure 2 shows an enlarged view of a part of the flue gas washer of figure 1;

15 Figure 3 shows a top view on a part of the flue gas washer of figures 1 and 2 in a reduced scale;

20 Figure 4 shows a view of a part of the flue gas washer along line C-D in figure 2;

25 Figure 5 shows details of the flue gas washer of the preceding figures with other embodiments of the supporting construction for the spray pipes;

30 Figures 6a, b and c show a top view, a side view and a sectional view along line A-B in figure 6a of a droplet separator packet;

Figure 7 shows another embodiment of a supporting construction for spray pipes of a flue gas washer in a side view; and

5 Figure 8 shows the embodiment of figure 7 in a view turned around 90°.

Figure 1 shows a vertical section through a part of a flue gas washer 1 which is formed as standing cylinder. The flow
10 direction of the flue gases is indicated by arrows and extends in figure 1 from below to above. In the flue gas washer 1 a lower coarse separator system 4 and an upper fine separator system 3 are disposed which consist of individual droplet separator packets, respectively. Each
15 droplet separator packet is supported with its end on two carriers 2 which extend over the cross-section of the flue gas washer.

Each droplet separator packet consists of a plurality of
20 droplet separator lamellae disposed parallel with respect to another and flown through by the flue gas flow and deflecting the flowing of the flue gas flow in order to cause a separation of the entrained droplets in this manner. Such droplet separators are known and do not form
25 part of the present invention.

Each droplet separator packet has in its end portions reinforced box-like portions 6 with which the packet lies on the carriers 2. These reinforced end portions 6 carry a
30 supporting construction 7 for spray pipes extending parallel with respect to the carriers 2 and serving for

cleaning of the droplet separator systems. The
corresponding spraying cones are shown on the left upper
side of figure 1. The spray pipes 8 are disposed above and
below the separator systems 3 and 4 so that the separator
5 packets are cleaned from above and from below.

The supporting construction 7 has vertical rod-like
supporting members 9 extending through the box-like
reinforced end portions 6 and anchored in the same.
10 Accordingly, these rod-like supporting members 9 extend
upwardly and downwardly from the reinforced end portions 6
and carry at their ends spray pipe carrying elements 10
connecting two supporting members 9 with one another.

15 Figure 2 shows the exact design of the supporting
construction for the spray pipes 8. One recognizes that the
fine separator system 3 consists of a droplet separator
packet lying on the two double-T-beams (H-beams) 2. Exactly
spoken, the droplet separator packet has two reinforced
20 box-like end portions 6 serving as bearings on the
carriers. Furthermore, these reinforced end portions 6
serve for the anchoring of vertical supporting members 9
extending upwardly and downwardly from the separator system
and provided at their end portions with spray pipe carrying
25 elements 10. As shown in figure 2, two spray pipes 8 are
located on each spray pipe carrying element 10.

Furthermore, one recognizes from figure 2 that traversing
paths 11 for inspections etc. are formed above and below
30 the carriers 2 which can be traversed by a service person
for inspection purposes etc. Since the supporting members 9

extend only over a relatively short distance in the direction perpendicular to the paper sheet plane an inspection of the separator systems 3, 4 from the traversing paths 11 is possible.

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Figure 3 shows a top view on about a quarter of the cross-section of the flue gas washer 1. One recognizes the traversing paths 11 formed over the carriers 2 which are shown in a hatched manner. The spray pipes 8 are located
10 between the carriers 2 and are supported on the carrying elements 10 wherein two spray pipes 8 are disposed between two carriers 2, respectively.

Figure 4 shows a view of the supporting construction 7 for
15 the spray pipes 8 in a position turned around 90° with respect to the view of figure 2. One recognizes that the vertical supporting members 9 extend only over a slight distance parallel to the plane of the drawing so that they can be anchored in the reinforced box-like portions 6 which
20 are centrally disposed in the respective end portion of a droplet separator packet. It is shown with this embodiment that the separator system 3 consists of a plurality of separator packets of which only several are provided with the reinforced end portions. The remaining packets which do
25 not take over a carrying function for the supporting construction are formed as normal separator packets. The nozzles disposed at the spray pipes 8 are shown at 12 and are spaced from one another in such a manner that their spraying cones overlap so that the whole range of the
30 separator packets can be cleaned. The individual lamellae of the separator packets are indicated at 13.

Figure 5 shows two different variants for fastening the supporting members 9 in the box-like reinforced end portions 6 of the separator packets. According to the left variant one member 9 extends through the reinforced end portion 6 and is welded to the same. The supporting member 9 extending through the reinforced end portion 6 forms outside of the reinforced end portion 6 an upper and a lower fastening flange with which two additional supporting members 9 are screwed which extend upwardly and downwardly and include the carrying elements 10 for supporting the spray pipes.

According to the right variant of figure 5 one supporting member 9 is inserted into the reinforced box-like end portion 6 and is fixed in the same in an appropriate holding construction 14. It extends through a slot on the upper side of the end portion 6 upwardly.

Figure 6a shows a top view of a separator packet. This is indicated at 3 and has the reinforced box-like end portions 6 respectively in the center of its end portions. Figure 6b shows a reinforced box-like end portion 6 in the side view with inserted supporting member 9. Figure 6c shows a side view turned around 90°.

Figure 7 shows a supporting construction according to which rod-like supporting members 16 are not disposed at the separator packets 15 but between the same. The rod-like supporting members 16 carry the spray pipes 8 by means of

brackets 17, and corresponding nozzles 12 are disposed at the spray pipes.

One recognizes in figure 8 that the supporting members 16
5 extend only slightly in the direction perpendicular to the
axis of the carriers 2 so that also in this case a large
free space is available between the supporting members 16
for inspection purposes. The range above the carriers 2 can
be traversed. The fastening of the supporting members 16
10 between the separator packets 15 is realized by means of
appropriate flange connections which are indicated at 18.

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